Name: Date:

# Exam: Function Reflections (Solution version 33)

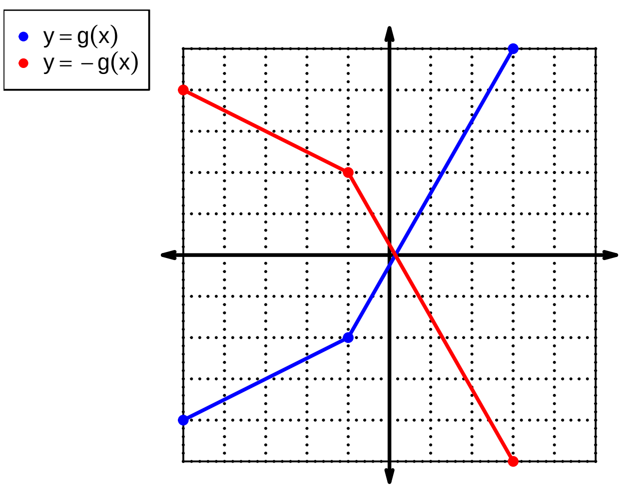
1. Let function $f$ be defined by the polynomial below:

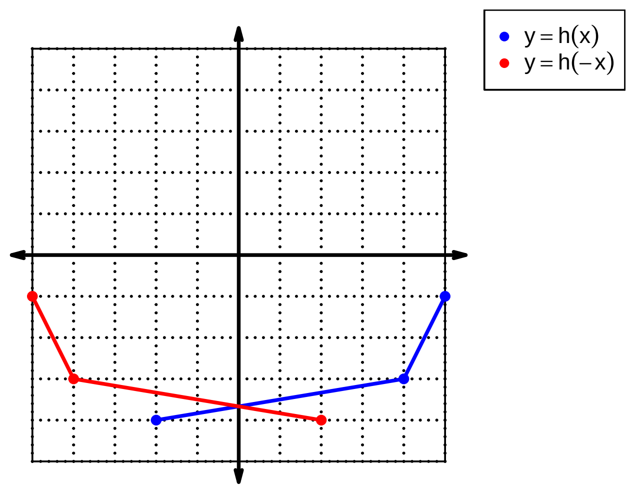
$$f(x) \; = \; -9x^5 - 7x^4 + 5x^3 - 2x^2 - 3x + 6$$

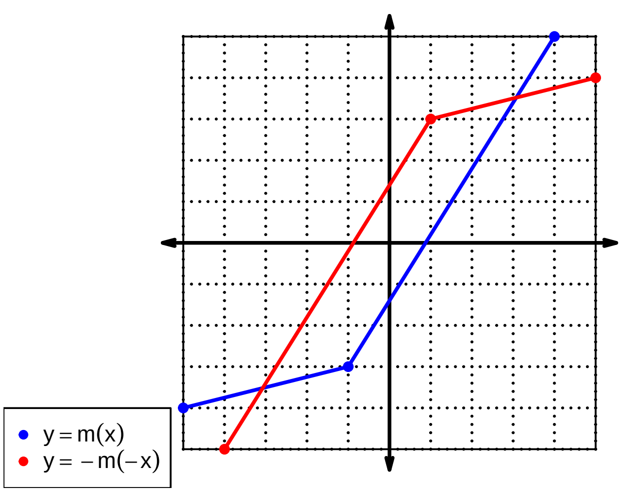
Draw lines that match each function reflection with its polynomial:

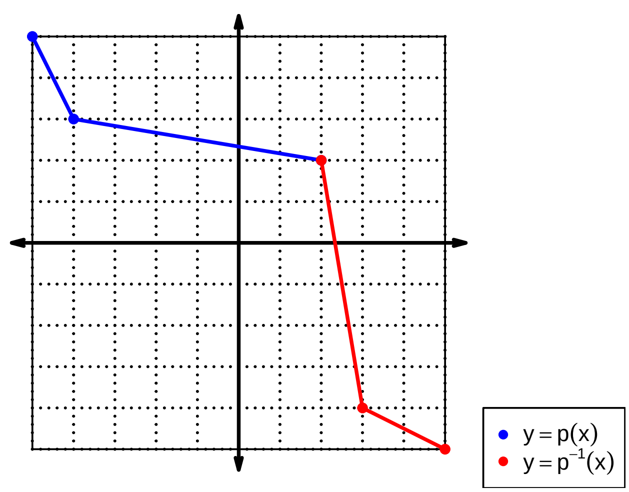
| Reflections | Polynomials |
|---|---|
| $-f(x)$ | $9x^5 + 7x^4 - 5x^3 + 2x^2 + 3x - 6$ |
| $-f(-x)$ | $-9x^5 + 7x^4 + 5x^3 + 2x^2 - 3x - 6$ |
| $f(-x)$ | $9x^5 - 7x^4 - 5x^3 - 2x^2 + 3x + 6$ |

2. In each $xy$ plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The $x$ axis is horizontal and the $y$ axis is vertical (as typical), and the scale is equal on both axes.



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For all questions on this page, the functions $f$, $g$, and $h$ are defined by the table below.

| $x$ | $f(x)$ | $g(x)$ | $h(x)$ |
|---|---|---|---|
| 1 | 6 | 3 | 7 |
| 2 | 8 | 6 | 3 |
| 3 | 5 | 4 | 5 |
| 4 | 2 | 9 | 6 |
| 5 | 7 | 1 | 2 |
| 6 | 3 | 7 | 9 |
| 7 | 9 | 8 | 4 |
| 8 | 4 | 2 | 1 |
| 9 | 1 | 5 | 8 |

3. Evaluate $g(6)$.

$$g(6) = 7$$

4. Evaluate $f^{-1}(4)$.

$$f^{-1}(4) = 8$$

5. By filling more rows of the table, it is possible to make function $f$ **even**. If that were done, what would be the value of $f(-5)$?

If function f is even, then

$$f(-5) = 7$$

6. By filling more rows of the table, it is possible to make function $h$ **odd**. If that were done, what would be the value of $h(-2)$?

If function h is odd, then

$$h(-2) = -3$$

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7. A function, $f$, is **even** if $f(x) = f(-x)$ for all $x$ in the domain. A function, $g$, is **odd** if $g(x) = -g(-x)$ for all $x$ in the domain.
   Let polynomial $p$ be defined with the following equation:

$$p(x) \; = \; x^2 - 1$$

   a. Express $p(-x)$ as a polynomial in standard form.

$$\begin{aligned} p(-x) &= (-x)^2 - 1 \\ p(-x) &= x^2 - 1 \end{aligned}$$

   b. Express $-p(-x)$ as a polynomial in standard form.

$$\begin{aligned} -p(-x) &= -\left(x^2 - 1\right) \\ -p(-x) &= -x^2 + 1 \end{aligned}$$

   c. Is polynomial $p$ even, odd, or neither?

   even

   d. Explain how you know the answer to part c.

   We see that $p(x) = p(-x)$ for all $x$ because $p(x)$ and $p(-x)$ are equivalent polynomials. Thus function $p$ satisfies the criterion for being an even function.

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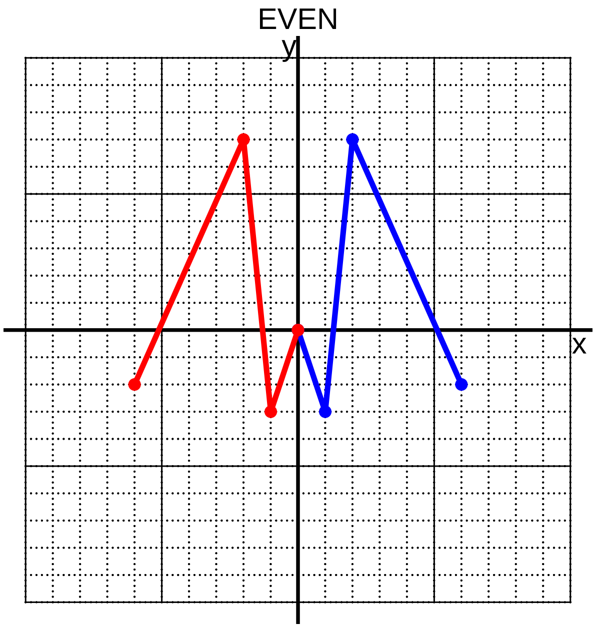
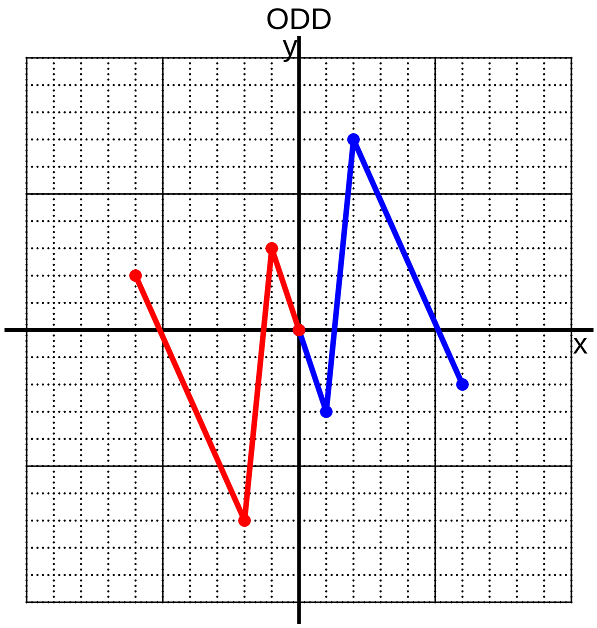
8. I have drawn half of a function. Draw the other half to make it even or odd.




9. Let function $f$ be defined with the equation below.

$$f(x) = \frac{x}{6} + 8$$

a. Evaluate $f(72)$.

step 1: divide by 6
step 2: add 8

$$f(72) = \frac{(72)}{6} + 8$$
$$f(72) = 20$$

b. Evaluate $f^{-1}(17)$.

step 1: subtract 8
step 2: multiply by 6

$$f^{-1}(x) = 6(x - 8)$$
$$f^{-1}(17) = 6((17) - 8)$$
$$f^{-1}(17) = 54$$

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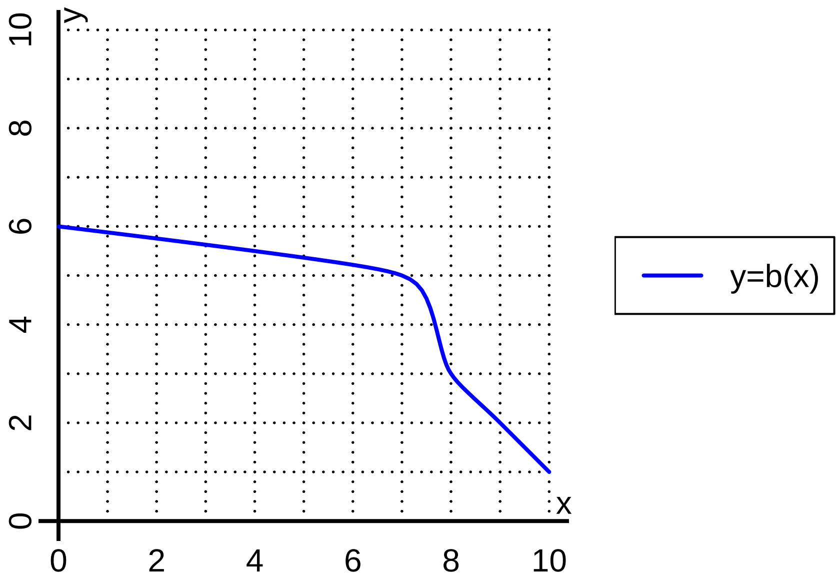
10. The function $b$ is represented by the curve $y = b(x)$ graphed below.




a. Evaluate $b(9)$.

$$b(9) \;=\; 2$$

b. Evaluate $b^{-1}(3)$.

$$b^{-1}(3) \;=\; 8$$

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11. Function $f$ is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

| $x$ | $f(x)$ | $-f(x)$ | $f(-x)$ | $-f(-x)$ |
|---|---|---|---|---|
| -2 | -5 | 5 | 5 | -5 |
| -1 | -6 | 6 | -6 | 6 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | -6 | 6 | -6 | 6 |
| 2 | 5 | -5 | -5 | 5 |

b. Is function $f$ even, odd, or neither?

neither

c. How do you know the answer to part b?

Function $f$ is neither because neither column $-f(-x)$ nor column $f(-x)$ matches column $f(x)$ exactly.